

Scientific Society of Cardiologists, 2012): TCS (> 5 mmol/L), TG (> 1.7 mmol/L) and AI (> 3 units); this reliably indicates the presence of hypertriglyceridemia and hypercholesterolemia.

Thus, inhabitants of the village showed an increased concentration of insulin in all groups and a lower level of cortisol and thyroxin (women) in non-indigenous population. Hypertriglyceridemia and hypercholesterolemia as well as a high atherogenic index were found in the representatives of non-indigenous male population.

High level of insulin, increased content of atherogenic fractions of lipoproteins, and suppressed synthesis of HDL at a low activity of the thyroid gland and adrenal cortex can give rise to the development of metabolic syndrome, especially in the representatives of non-indigenous population.

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REFERENCES:

1. Poteryaeva O.N. Russkikh G.S. Mokrushnikov P.V. [i dr.] Gormonal'nyj status, lipidnyj spektr i mikrovyazkost' membran u zhitel'nits Severa [Hormonal status, lipid spectrum and membrane microviscosity in the North

women]. Vestnik Ural'skoj meditsinskoj akademicheskoy nauki [Herald of Ural Medical Academic Science]. 2014, № 2, p. 149-152.

2. Panin L.E. Gomeostaz i problemy pripolyarnoj meditsiny (metodologicheskie aspekty adaptatsii [Homeostasis and problems of subpolar medicine (methodological aspects of adaptation)]. SD RAMS Bulletin, 2010, V. 30, № 6, P. 6-11.

3. Keyl V.R. Nikolaev Yu.A. Selyatitskaya V.G. [et al.] Sostoyanie zdorov'ya rabotnikovalmazodobyvayushhej promyshlennosti Yakutii [Level of health in Yakutia diamond industry workers]. Novosibirsk, Nauka, 2009, 168 p.

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THE HEMOGRAM CONDITION OF THE SAKHA REPUBLIC'S NORTHERN AND CENTRAL POPULATION

ABSTRACT

We studied peripheral blood parameters of population of the northern (Anabarskij) and central (Megino-Kangalasskij) regions (uluses) of Yakutia. We revealed significant differences in the hemogram. More than 50% of the residents of the Megino-Kangalasskij ulus have increased red blood cell count and hemoglobin concentration, which is not typical for the indigenous people, especially for women. The Anabarskij ulus residents have absolute and relative monocytosis probably associated with food and the environment. The blood count is more harmonious in the population of the Anabarskij ulus.

Keywords: Arctic, hemogram, golden blood proportion, monocytosis.

INTRODUCTION

Currently the incidence rate of our population needs a serious care for human's state of health, in connection with possible harmful effects of surrounding and social environment factors, defining effects of their impact on health, which requires biomedical research with finding a morphologic composition of peripheral blood. Totality of quantitative and qualitative indices of complete blood count characterizes cell counts of the peripheral blood,

condition of the functional reserves of the body, adaptive processes of the hematopoietic system in response to the intensity and character change of influencing environmental factors. Besides that, participation of hematosis organs in forming mechanisms of protection and compensating for various pathologic processes is estimated [7]. That's why available and fast analysis of hemogram is used for rating adaptation condition of human's organism.

Purpose. Evaluation of hematologic

blood indices of Anabarsky and Megino-Kangalassky districts' residents.

MATERIALS AND METHODS

Research was conducted among working-age population from Northern and Central districts at the age of 18 to 65. In total 386 people were surveyed, 184 from Anabarsky district and 202 from Megino-Kangalassky district.

Cells of peripheral blood per unit volume (1mm^3) of blood were determined by a hematologic automatic analyzer MICROS 60 (France), using

J.T. BAKER's (Netherlands) reagents.

Following parameters of peripheral blood were determined: the quantity of red blood cells (RBC) and white blood cells (WBC), concentration of hemoglobin (HGB). Determination of color index was calculated by dividing triple quantity of gram% hemoglobin to the first two numbers of erythrocyte counts. The ideal formula of white blood in the percentage calculation is close to the Fibonacci sequence (basophils, stab neutrophils -1%, eosinophils -3%, monocytes - 5%, lymphocytes 30-34%, segmental neutrophils - 58-62%), and the ratio of the sum of granulocytes to the sum of agranulocytes is close to the golden proportion (1,618) [3,4,9]. The golden proportion of blood was calculated among selected leukograms close to the Fibonacci sequence by calculating the ratio of granulocytes to agranulocytes. The harmonious formula of a healthy person's white blood shall not deviate from the golden ratio to the increasing or decreasing side that is more than 12% (1,424-1,812). If the deviation exceeds from 12 to 23% in one or another side, it would mean a light disbalance and disharmony in a white blood cell system, and the deviation of more than 24% and higher means hard disbalance [4]. Static result processing was conducted using statistical package SPSS 11.5 for Windows. Quantitative data are presented as average indices

(M) and as a standard error of the mean (m) in a normal distribution of indices. Statistical significance of differences was determined by Student's *t*-test for independent samples, threshold level of statistical significance was taken at the value of $p < 0.05$.

RESULTS AND DISCUSSION

According to the results the data obtained, the average indices of Anabarsky and Megino-Kangalassky districts' residents were within normal values, except the proportion of monocytes of Anabarsky district's inhabitants, which indices were higher than its recommended rates. Comparative analysis of hemogram revealed significant differences between the residents of both areas (tab.1).

Comparative analysis of red blood data by sex revealed that men of Megino-Kangalassky district in comparison with men of Anabarsky district had a significantly higher average number of red blood cells and the hemoglobin concentration, so they were at the upper limit of normal.

The increase of the number of red blood cells and the hemoglobin concentration was found in 48% of Megino-Kangalassky district's men and 42.6% of Anabarsky district's men; increasing the number of red blood cells was observed only in 9% of men, the level of hemoglobin was significantly lower in 45%.

Among women the average indices of hemogram were in the zone of physiological norm and were significantly different depending on the place of residence, although the average number of red blood cells was at the upper limit of normal for both Anabarsky and Megino-Kangalassky districts' residents (tab. 1).

At the same time, the increase of the number of red blood cells was found in 41% of Megino-Kangalassky district's women and 26% of Anabarsky district's women, and erythropenia was found in 3.73% and 2.15% accordingly. The increase of the level of hemoglobin concentration was revealed for the half of the surveyed women of Megino-Kangalassky district, as well as men, which was 55.4%. The decrease of the level of hemoglobin concentration in 27.8% was observed for the women of Anabarsky district.

The color index is located on the lower limit of normal range for men and women of Anabarsky district, which is 38% and 42% respectively.

It is known from the literary sources that one of the most frequent occurrences of external positive reasons for an increasing number of red blood cells and the level of hemoglobin concentration is physical activity or living in the highlands. And the negative factors include smoking, alcohol, harmful substances and helminthiasis. Increasing level of hemoglobin

Hematologic indices of blood depending on the district and gender

Hemogram indices	Anabarsky district	Megino-Kangalassky district	p	Men		p	Women		p
				Anabarsky district (n=44)	Megino-Kangalassky (n=68)		Anabarsky district (n=140)	Megino-Kangalassky (n=134)	
Erythrocytes,	4,57±0,4	4,7±0,03	0,000	4,75±0,07	5,11±0,06	0,000	4,51±0,48	4,57±0,04	
Hemoglobin	125,5±1,31	145,57±0,00	0,000	131,77±2,11	159,22±1,56	0,000	123,53±1,56	138,65±2,97	0,000
Color index	0,82±0,00	0,92±0,00	0,000	0,83±0,00	0,92±0,00	0,000	0,82±0,00	0,91±0,00	0,000
Leukocytes	6,21±0,13	5,53±0,09	0,000	6,82±0,34	5,6±30,15	0,000	6,01±0,13	5,47±0,12	0,004
Segmented, %	54,72±0,56	62,60±0,63	0,000	55,55±1,23	62,85±1,14	0,000	54,47±0,62	62,47±0,76	0,000
Lymphocytes, %	35,84±0,58	30,77±0,69	0,008	35,06±1,26	30,38±1,04	0,008	36,08±0,66	30,96±0,89	0,000
Monocytes, %	9,43±0,21	6,63±0,35	0,000	9,38±0,36	6,76±0,22	0,001	9,44±0,25	6,56±0,52	0,000
ESR, mm/h	10,81±0,66	13,66±0,76	0,005	8,18±1,19	8,89±0,93		11,63±0,76	15,89±0,97	0,000
Golden section of blood	1,281±0,03	1,842±0,05	0,000	1,345±0,08	1,880±0,09	0,000	1,261±0,03	1,823±0,06	0,000

concentration in blood leads to blood becoming more viscous, which impedes its normal advancement through the vessels, and these phenomena can lead to the formation of thrombi and blood clots and as a result it leads to vascular occlusion, heart attacks and strokes [7].

According to evaluation of differential WBC on all types of white blood cells significant gender differences were found in districts. So, neutrophilia was detected in 20.58% of men and 21% of women in Megino-Kangalassky district. Leukopenia was detected in one-quarter of men in Anabarsky district and lymphocytosis was detected in one-quarter of women. Absolute and relative monocytosis was detected in a half of surveyed men and women of Anabarsky district, which is 54% and 55% accordingly (tab.1).

It is known from the literary sources that monocytes/macrophages have higher activity than neutrophils in an acidic environment [5]. One of the reasons for the Arctic inhabitants to have monocytosis might be native traditional nutrition with constant and high protein intake (meat of wild deer and fish), which is one of the factors of internal environment oxidation. Besides that, any stress effect of hypoxic nature in the early stages and in the process of tissue hypoxia increasing leads to mononuclear phagocyte activation of bone marrow. That is why monocytosis is a non-specific response of the body to any stress effect both internal and external [8]. Environment of Anabarsky district is under a sufficiently high anthropogenic impact. Over the recent years the mining industry is rapidly developing in the area. Mining complexes were created and now are operating at the alluvial diamond deposits. It is known that intensive developing of natural resources of the Far North, with its extremely vulnerable nature, is the cause of the ecological crisis. Soil cover of the village Saskylakh is contaminated with iron, ammonia nitrogen. Low content of organic matter also shows the pollution of soil-ground.

Water of Anabar river near Saskylakh village had a decreased mineralization (up to 102 mg/l) and is contaminated with iron (1.8), copper (1.8), suspended solids (44), COD (2.8), and ammonium ions in the summer season (5.6) [1,10].

So the response of monocytic germ of hematopoiesis to various extreme factors consists of the specific and non-specific components. Non-specific component appears in increasing the total number of monocytic cells in the bone marrow. The severity and nature of the reaction

of monocytopenia activation can be considered as a specific component, which is determined by the nature of extreme factors.

An accelerated ESR was observed in 18% of men and 22% of women in Anabarsky district and 23.3% of men and 35% of women in Megino-Kangalassky district.

The average values of the golden section of blood were within easy imbalance among residents of both districts. Harmonic formula of leukogram was detected in 13.6% of men and 18.5% of women of Anabarsky district and in 29.4% of men and 19.4% of women of Megino-Kangalassky district. A strong disharmony of leukogram towards increasing (above 2,006) was observed in 11.7% of men of the Central district. The shift of leukogram towards decreasing (below 1,229) was observed in 3% and 15% of males of both districts. Among women a strong disharmony of leukogram towards increasing was observed in 8.2% of women of Megino-Kangalassky district. A strong disharmony was not observed in inhabitants of Anabarsky district regardless of gender. A high imbalance towards decreasing was observed in 4.5% of women of Megino-Kangalassky district and in 13.6% of women of Anabarsky district.

From the standpoint of the nature, the meaning of the harmonious functioning of the organism is to make its systems, organs and cells to perform their functions with the smallest expense of energy. Harmony of components of the organism as a whole and one of its most important parts – blood – is associated with resonances in nature, in many ways based on the golden ratio (GR) [2,3,9,11].

Loss of the golden ratio – disharmony of immune system – largely depends on the state of the internal environment of the organism and severe disharmony of the golden ratio of blood towards increasing is always qualitatively worse than disharmony towards decreasing.

CONCLUSION

Thus, we could conclude, that according to the results of hematological blood tests among residents of the North Anabarsky and the Central Megino-Kangalassky districts, significant differences in the parameters of hemogram were observed. Men and women of the Central district have an increased red blood cell count and hemoglobin concentration, which is alarming and requires further in-depth biomedical research, as these changes

are rare, particularly among indigenous women of Yakutia. An absolute and relative monocytosis, found in the population of the Arctic district, might be associated with the specific nutrition and the deterioration of the ecological state of the environment, connected with the mining industry's activity in recent decades. The population of Anabarsky district, both men and women, has a more harmonious hemogram than the residents of Megino-Kangalassky district.

References:

1. Gerasimova L.V. Himicheskiy sostav vody reki Anabar v rajone poselka Saskylakh (Respubliki Saha (Yakutiya)) [The chemical composition of the water in the river Anabar settlement Saskylakh area (the Republic of Sakha (Yakutia))] URL: <http://www.rae.ru/forum2010/54/961> (Data obrashcheniya: 11.10.2015).
2. B.M. Kershengolts [et.al.] Biopreparaty iz prirodnogo rastitel'nogo biosyr'ya v sohraneni i zdorov'ya naseleniya v usloviyah izmenenij klimata (obzor) [Biological products from natural plant bio raw- stuff in preserving the health of the population in the context of climate change (review). *Ehkologiya cheloveka*. – 2010. – №3. – S. 8 – 15.
3. Kidalov V.N. Ochishchenie krovi. Princip «zolitogo secheniya» v metoda harmonizacii zdorov'ya [Cleansing the blood. The principle of «golden section». SPb.: Izdatel'skij dom «Neva»; M.: OLMA-PRESS EHklibris.-2003.-160 p.
4. Kidalov V.N., Kulikova L.N. Chetyre gruppy krovi i zdorov'e. [The four blood groups and health]. SPb.: Izdatel'skij dom «Neva»; M.: OLMA-PRESS EHklibris, 2003, 128 p.
5. G.I. Kozinec [i dr.]. Krov' i infekciya [Blood and infection]. M.: Triada-Farm, 2001, 456p.
6. G.I. Kozinec [i dr.]. Krov' i ehkologiya [Blood and ecology]. M.: Prakticheskaya medicina, 2007, 432 p.
7. Kozinets G.I., Vysotskij V. V. Krov' i biokosmicheskiy aspekt cheloveka [Blood and biocosmic aspect of human]. *Gematol. i transfuziol*, 2012, V. 57, № 3, pp. 40-46.
8. Ulitko M. V. Rol' monocitov-makrofagov v adaptivnykh reakciyakh krovetvornoj tkani pri dejstvii na organizm ehkstremaal'nykh faktorov: diss. ... kand. biol. nauk [Role of monocyte-macrophages in adaptive reactions of hematopoietic tissue at the action on the organism of extreme factors: PhD (Biology) diss...Ekaterinburg, 2008, 183 p.
9. Subbota A.G. «Zolotoe seche-

nie» (Sectio aurea) v medicine [«Golden Section» (Sectio aurea) in medicine]. SPbVMA, 1994, 143 p.

10. Tuprina S.E., Legostaeva Ya.B. Ehkologicheskoe sostoyanie mal'nyh naselennykh punktov v lesotundrovoj zone na primere sela SaskylahAnabar-skogo ulusa RS (Ya) [The ecological status of small settlements in the forest-tundra zone on the example of the village Saskylakh Anabar ulus Republic Sakha (Yakutia)]. Uspekhi sovremennogo estestvoznaniya, №8, 2011, P. 71.

11. Shevelyov I.Sh., Marutaev M.A., Shmelyov I.P. Garmoniya kak zakonornost' prirody. Zolotoe sechenie.

Tri vzglyada na prirodu garmonii [Harmony as the law of nature. Golden Section. Three views on the nature of harmony]. M.:Strojizdat, 1990, 343 p.

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STATUS OF PRO- AND ANTIOXIDANT BALANCE IN FREESTYLE WRESTLERS IN YAKUTIA IN DIFFERENT SEASONS

ABSTRACT

We studied a state of pro- and antioxidant balance in the athletes - freestyle wrestlers of Yakutia, aged from 18 up to 29 years. It is revealed that the CAOP/LPO characterizing pro-antioxidant balance depends on a season. The lowest CAOP/LPO values are noted during the winter period that is caused by the prooxidant processes connected with increase of Thiobarbituric acid reactive substances (TBARS) concentration. The intensification the CAOP/LPO in spring time is connected with activation compensatory adaptation reactions from antioxidant protection (increase of activity of SOD and CAT).

Keywords: lipid peroxidation, antioxidant protection, pro- and oxidant balance, seasons.

INTRODUCTION

The most important component of the adaptive reactions of the body is a system of “lipid peroxidation (LPO) - antioxidant protection (AOP)”, which allows evaluating the stability of biological systems to the effects of external and internal environment. In normal living conditions in the functioning of systems in terms of the physiological optimum exists pro- and antioxidant balance, which is an essential mechanism of oxidative homeostasis.

It is known that intense exercise leads to excessive formation of reactive oxygen species and a significant increase in the speed of lipid peroxidation (LPO). In the few publications it is shown that lipid peroxidation processes play an important role in the development of fatigue and reduced physical performance [1,16]. Analysis of published data shows that the state of the pro- and antioxidant balance in the different stages of the training cycle at the freestyle wrestlers, practicing in the Republic Sakha (Yakutia), little studied. There are only a few works [5, 6, 7, 8].

The aim of this study was to evaluate

the state of the pro- and antioxidant balance in athletes of the Republic of Sakha (Yakutia), engaged in wrestling.

MATERIAL AND METHODS

As objects of study we chose athletes - wrestlers of high school sports in Yakutsk. A total of 45 ethnic Yakut men, aged 18 to 29 years old, were under study. Athletes had the highest sports skills and were candidates for master of sports, master of sports of international class masters of sports, Honored Master of Sports.

The intensity of free radical oxidation of lipids was evaluated spectrophotometrically by accumulation of erythrocyte membranes products react with thiobarbituric acid (TBA-RP) [9]. Indicators of non-enzymatic antioxidant defense level were determined by the total content in the blood serum of low molecular weight antioxidants (LMAO) [10]. Characteristics of enzymatic antioxidant defense unit (AOD) were determined by the activity of the enzymes superoxide dismutase (SOD) in blood erythrocytes [12], catalase (CAT) in the blood serum [2].

To determine the antioxidant status

at equilibrium at different stages of study was calculated using the formula coefficient:

$$C_{AOP/LPO} = (LMAO + SOD + CAT) / TBA-RP.$$

The obtained data were statistically processed by the statistical package STATISTICA software application.

RESULTS AND DISCUSSION

According to our data, the content of low molecular weight antioxidants (LMAO) in the membranes of red blood cells in athletes winter statistically significantly increased in 1,43 times in comparison with the level in the autumn of the year. In the spring there was a decrease of this index by 18%. Changes in the activity of superoxide dismutase (SOD) and catalase (CAT), depending on the season was the same. We note the tendency of increase of these enzymes. The lowest values were observed in the autumn, the highest in winter (Table. 1).

The level of TBA-reactive products (TBA-RP) in winter was significantly higher ($p < 0.01$) than in the autumn and spring seasons (Fig. 1). A significant increase of TBA-RP in the winter was probably due to the fact that at this time